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(54) POLYESTER RESIN FOR TONER AND FULL COLOR TONER

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a polyester resin for toner suitable for use in an oilless fixing system in an electrophotographic process, an electrostatic printing process, an electrostatic recording process, etc., and to provide a full color toner excellent in anti-offsetting property, fixability and transparency.

SOLUTION: The polyester resin has $\geq 60\%$ transmittance at 800 nm when 5 mass% carnauba wax is contained and the maximum molecular weight of the polyester resin in its molecular weight distribution is in the range of 100,000-2,000,000. The full color toner contains the polyester resin, carnauba wax and colorants and has $\geq 40\%$ transmittance at 800 nm.

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CLAIMS

[Claim(s)]

[Claim 1] Polyester resin for toners which whose permeability in 800nm at the time of carnauba wax 5 mass % content is 60% or more, and has the maximum molecular weight in molecular weight distribution in the range of 100,000-2 million.

[Claim 2] Polyester resin for toners according to claim 1 whose glass transition temperature is 55-65 degrees C and whose softening temperature the aromatic series diol component of the 30-100-mol section is contained to all the 100 mol sections of acid components, and is 105-120 degrees C while containing the polyhydric-alcohol component more than trivalent [of the 1-30 mol section] to all the 100 mol sections of acid components.

[Claim 3] The full color toner whose permeability in 800nm the polyester resin for toners according to claim 1 or 2, carnauba wax, and a coloring agent are contained, and is 40% or more.

[Claim 4] The full color toner according to claim 3 which is a fixing process and does not need oil.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the polyester resin used for the development of an electrostatic-charge image or a magnetic latent image, and a full color toner in a xerography, an electrostatic printing method, an electrostatic recording method, etc.

[0002]

[Description of the Prior Art] In the approach of obtaining **** more lasting than an electrostatic-charge image, this is established, after developing negatives with the toner which electrified beforehand the electrostatic-charge image formed on the photoconductivity photo conductor or the electrostatic recording object by friction. After fixing carries out welding of the toner image obtained by development on the photoconductivity photo conductor or the electrostatic recording object directly on paper or a film or imprints a toner image on paper or a film, it is performed by carrying out welding of this on an imprint sheet. Welding of a toner image is performed by contact with a solvent steam, pressurization, and heating. Although there are a non-contacted heating method by electric oven or the flash plate method and a sticking-by-pressure heating method by the heating roller as heating method, recently when improvement in the speed of a fixing process is demanded, the latter is mainly used.

[0003] As a toner used by the dry-developing method, there are a 1 component system toner and a two-component system toner. coarse grinding after the two-component system toner's having carried out melting kneading of resin, a coloring agent, an electric charge control agent, and the required additive and making it fully distribute them first in addition to this -- subsequently it pulverizes, and is classified and manufactured by the predetermined size range. 1 component system toner adds the magnetic iron powder other than each component of the above-mentioned two-component system toner, and is manufactured similarly.

[0004] As resin used for manufacture of a toner, although an epoxy resin, polyester resin, polystyrene resin, methacrylic system resin, etc. are known, since these resin is the principal components in a toner, it governs most engine performance required of a toner. Therefore, various engine performance -- to excel in the dispersibility of the coloring agent in the melting kneading process at the time of toner manufacture and the grindability in a grinding process etc. is demanded, and it is excellent in fixable, un-offsetting nature, blocking resistance, and an electrical property at the time of use of a toner -- is required of the resin for toners.

[0005] Furthermore, in order to obtain a color picture, the toner (full color toner) of three to 4 color must be made to have to adhere to paper etc., and subsequently you have to make it have to color in a fixing process, carrying out melting mixing of these toners, and have to make it established in an above-mentioned development process. That is, while the outstanding transparency is required for the resin for full color toners, fixable [outstanding] (melting fluidity) is required for it.

[0006] Moreover, in a fixing process, although it is necessary to prevent the offset phenomenon of a toner therefore, when bridge-formation-izing and macromolecule quantification of resin are performed, it is in the inclination for fixable to fall. Then, especially in the full color copy, it is applying oil, such as

a silicone system, to the fixing roller front face of a copying machine, and a means to prevent offset is used.

[0007]

[Problem(s) to be Solved by the Invention] However, if oil was used in a fixing process, since oil would adhere to the paper in which the toner was established, after fixing a toner image, it might become difficult to enter seal and an alphabetic character in paper etc. further. Furthermore, oil free-ization of a fixing system is desired with a miniaturization and improvement in the speed of a printer.

[0008] The purpose of this invention is offering the polyester resin for toners which can be used suitable for the fixing system in a xerography, an electrostatic printing method, an electrostatic recording method, etc. which does not use oil, and is offering the full color toner excellent in un-offsetting nature, fixable, and transparency further.

[0009]

[Means for Solving the Problem] this invention persons completed a header and this invention for the ability of the polyester resin which has specific physical properties to solve the above-mentioned technical problem, as a result of inquiring wholeheartedly.

[0010] That is, the permeability in 800nm at the time of carnauba wax 5 mass % content is 60% or more, and about the polyester resin for toners which has the maximum molecular weight in molecular weight distribution in the range of 100,000-2 million, this invention contains the resin concerned, carnauba wax, and a coloring agent, and relates to the full color toner whose permeability in 800nm is 40% or more.

[0011]

[Embodiment of the Invention] Permeability [in / in the polyester resin for toners of this invention / 800nm at the time of carnauba wax 5 mass % content] needs to be 60% or more. Since it is difficult for this to reconcile the un-offsetting nature and transparency of a toner as the permeability under these conditions is less than 60%, it is because it is in the inclination for the application of a fixing system which does not use oil to become difficult. It is 70% or more preferably.

[0012] Moreover, the polyester resin for toners of this invention needs to have the maximum molecular weight in molecular weight distribution in the range of 100,000-2 million.

[0013] This is because it is in the inclination for the un-offsetting nature of a toner to fall that the maximum molecular weight is less than 100,000. It is 200,000 or more preferably. Moreover, when the maximum molecular weight exceeds 2 million, it is in the inclination for the transparency of a toner to fall. It is 1 million or less preferably.

[0014] As for the polyester resin for toners of this invention, it is desirable to contain the polyhydric-alcohol component more than trivalent in the range of the 1-30-mol section to all the 100 mol sections of acid components.

[0015] This is because it is in the inclination used as that in which the un-offsetting nature of a toner was further excellent by carrying out the content of the polyhydric-alcohol component more than trivalent to more than the one-mol section. It is more than the five-mol section more preferably. Moreover, it is in the inclination for the blocking resistance of a toner to become what was more excellent, by carrying out to below the 30-mol section. It is below the 25-mol section more preferably.

[0016] As a polyhydric-alcohol component more than trivalent, they are a sorbitol, 1, 2 and 3, a 6-hexa tetra-rol, 1, 4-sorbitan, pentaerythritol, dipentaerythritol, tripentaerythritol, 1 and 2, 4-butane triol, 1 and 2, 5-PENTA triol, glycerol, isobutane triol, and 2-methyl, for example. - 1, 2, 4-butane triol, trimethylol propane, 1 and 3, 5-trihydroxy methylbenzene, etc. can be mentioned. although these may be used independently if needed, or two or more sets are seen and they may be used, especially, pentaerythritol and trimethylol propane are in the inclination which does not spoil transparency but can improve un-offsetting nature, and are desirable.

[0017] Moreover, as for the polyester resin for toners of this invention, it is desirable to contain an aromatic series diol component in the range of the 30-100-mol section to all the 100 mol sections of acid components.

[0018] This is because it is in the inclination for the blocking resistance of a toner to become what was

further excellent by carrying out the content of an aromatic series diol component to more than the 30-mol section. It is more than the 40-mol section more preferably. Moreover, it is in the inclination for the reactivity at the time of a polyester resin polymerization and the blocking resistance of a toner to become what was further excellent, by carrying out to below the 100-mol section. It is below the 90-mol section more preferably.

[0019] As an aromatic series diol component, it is a polyoxyethylene, for example, - (2.0) -2, a 2-bis(4-hydroxyphenyl) propane, Polyoxypropylene - (2.0) -2, a 2-bis(4-hydroxyphenyl) propane, Polyoxypropylene (2.2)-polyoxyethylene - (2.0) -2, a 2-bis(4-hydroxyphenyl) propane, Polyoxypropylene (6) -2, a 2-bis(4-hydroxyphenyl) propane, Polyoxypropylene (2.2) -2, a 2-bis(4-hydroxyphenyl) propane, Polyoxypropylene - (2.4) -2, a 2-bis(4-hydroxyphenyl) propane, polyoxypropylene (3.3) -2, a 2-bis(4-hydroxyphenyl) propane, etc. can be mentioned. the polyoxypropylene (n) which is $2.1 \leq n \leq 8$ especially although these may be used independently if needed, or two or more sets are seen and you may use it -- it is in the inclination especially whose blocking resistance of a toner improves and is desirable when -2, a 2-bis(4-hydroxyphenyl) propane, and the (Polyoxyethylene n)-2 and 2-bis(4-hydroxyphenyl) propane that is $2.0 \leq n \leq 3.0$ are used.

[0020] Moreover, the polyester resin for toners of this invention can be made to contain an aliphatic series diol component as a constituent. When aliphatic series diol is used at the time of a resin polymerization, it is in the inclination whose reactivity (condensation polymerization reaction rate) improves.

[0021] As aliphatic series diol, ethylene glycol, neopentyl glycol, propylene glycol, butanediol, a polyethylene glycol, 1, 2-propanediol, 1,4-butanediol, a diethylene glycol, triethylene glycol, 1, 4-cyclohexane dimethanol, hydrogenation bisphenol A, etc. can be mentioned, for example. Although they may be used independently if needed or may carry out two or more combination use, these are in the inclination fixable [whose / of a toner] improves more and are desirable when ethylene glycol, neopentyl glycol, and butanediol are used.

[0022] Moreover, in the polyester resin for toners of this invention, a divalent carboxylic acid and/or the multiple-valued carboxylic acid more than trivalent contain as a constituent.

[0023] As a divalent carboxylic-acid component, a terephthalic acid, isophthalic acid, a phthalic acid, a sebacic acid, an isodecyl succinic acid, a maleic acid, a fumaric acid, adipic acids and these monomethyl, monoethyl, dimethyl, diethyl ester, these acid anhydrides, etc. can be mentioned, for example. Moreover, as a multiple-valued carboxylic-acid component more than trivalent, trimellitic acid, pyromellitic acid, 1 and 2, 4-cyclohexane TORIKARUBONN acid, 2 and 5, 7-naphthalene tricarboxylic acid, 1 and 2, 4-naphthalene tricarboxylic acid, 1 and 2, 5-hexane tricarboxylic acid, 1, 2 and 7, 8-octane tetracarboxylic acid, these acid anhydrides, etc. can be mentioned, for example.

[0024] Although these may be used independently, respectively, or they may be used in consideration of balance with the glass transition temperature of the polyester resin obtained etc., combining more than one, especially, a terephthalic acid, isophthalic acid, and an adipic acid are desirable in respect of fixable [of a toner], and trimellitic acid and/or an acid anhydride are desirable in respect of un-offsetting nature.

[0025] In manufacture of the polyester resin for toners of this invention, the heating temperature up of the above-mentioned component is supplied and carried out to a reaction container, and an esterification reaction or an ester exchange reaction is performed. Subsequently, the water or alcohol produced at this reaction according to the conventional method is removed. Although a polymerization reaction is carried out succeeding after that, condensation polymerization is performed carrying out distillate removal of the diol component under the vacuum below 150mmHg (20kPa) at this time. Moreover, at the time of an esterification reaction, an ester exchange reaction, and condensation polymerization, titanium butoxide, dibutyltin oxide, acetic-acid tin, zinc acetate, 2 tin sulfides, an antimony trioxide, a NI germanium dioxide, etc. can be used as a catalyst.

[0026] Although not limited about polymerization temperature and especially the amount of catalysts, in order to reduce the aliphatic series diol component generated as a by-product at an elevated temperature, it is desirable to choose the catalyst which reacts also in the field where reaction temperature is

comparatively low. For example, an antimony trioxide, titanium butoxide, and dibutyltin oxide are used suitably.

[0027] moreover, in manufacturing the polyester resin which has a gelation component Since a gelation reaction arises in the course which advances condensation polymerization and the viscosity in the system of reaction rises rapidly, carrying out distillate removal of the diol component under a high vacuum Corresponding to this viscosity rise, it is desirable to adjust the degree of vacuum in the system of reaction, and to control a gelation reaction, and it is desirable to return the pressure in the system of reaction to ordinary pressure, when desired viscosity is reached, to pressurize with nitrogen, and to pick out resin from a reaction container.

[0028] As for the polyester resin for toners of this invention, it is desirable that it is the range whose glass transition temperature is 55-65 degrees C. This is because it is in the inclination for the blocking resistance of a toner to become good by making glass transition temperature into 55 degrees C or more. It is 57 degrees C or more more preferably. Moreover, it is in the inclination for fixable [of a toner] to become good, by making glass transition temperature into 65 degrees C or less. It is 63 degrees C or less more preferably.

[0029] Moreover, as for the polyester resin for toners of this invention, it is desirable that it is the range whose softening temperature is 105-120 degrees C. This is because it is in the inclination for the un-offsetting nature of a toner to become good by making softening temperature into 105 degrees C or more. It is 110 degrees C or more more preferably. Moreover, it is in the inclination for fixable [of a toner] to become good, by making softening temperature into 120 degrees C or less. It is 115 degrees C or less more preferably.

[0030] Furthermore, as for the polyester resin for toners of this invention, it is desirable that the acid number is the range of 0.5 - 20 mgKOH/g. This is because it is in the inclination for the image stability of a toner to become good by making the acid number into 0.5 or more mgKOH/g. Moreover, it is because it is in the inclination for the moisture resistance of a toner to become good by making the acid number into 20 or less mgKOH/g. They are 18 or less mgKOH/g more preferably.

[0031] A full color toner can be obtained by blending the polyester resin of this invention, and carnauba wax and a coloring agent.

[0032] Carnauba wax is a component for raising the un-offsetting nature of a full color toner, and it is desirable to make it contain in the range of 1 - 10 mass % in a toner. This is because it is in the inclination whose un-offsetting nature of a toner improves by carrying out the content of a KARUBANA wax to more than 1 mass %. Preferably, it is more than 3 mass %. Moreover, it is because it is in the inclination for the transparency of a toner to be excellent by carrying out to below 10 mass %. Preferably, it is below 8 mass %.

[0033] A coloring agent is blended with the full color toner of this invention. As a coloring agent, the color of a chromatic color, and a lake system disazo condensation pigment and a lake system condensation diazo pigment are used. Especially the coloring agent used in this invention is not limited. As for the amount of the coloring agent used, it is desirable that it is the range of 0.1 - 10 mass % in a toner. It is more than 0.5 mass % more preferably, and is below 8 mass %.

[0034] Moreover, an electric charge control agent can be combined with the full color toner of this invention for the purpose of adjustment of the amount of electrifications, and grant of electrification stability. As an electric charge control agent which makes a toner negative polarity, for example, the metal complex of the alkyl derivative of a metal-containing monoazo color, a copper-phthalocyanine color, and a salicylic acid, quarternary ammonium salt, a nitro IMIDAZORU derivative, etc. can be mentioned, and a metal-containing monoazo color is desirable especially. Two or more these may be combined and may be used. As for the amount of the electric charge control agent used which shows such negative polarity, it is desirable that it is the range of 0.1 - 3 mass % in a toner. It is more than 0.4 mass % more preferably, and is below 2.5 mass %.

[0035] As an electric charge control agent which makes a toner straight polarity, the Nigrosine color, the phenylmethane system color which contains tertiary amine as a side chain, a quarternary-ammonium-salt compound, cetyl trimethylammonium bromide, polyamine resin, and an imidazole derivative can be

mentioned, for example, and the Nigrosine color is desirable especially. Two or more these may be combined and may be used. As for the amount of the electric charge control agent used which shows such straight polarity, it is desirable that it is the range of 0.1 - 5 mass % in a toner. More preferably, it is more than 0.4 mass %, and is below 4.5 mass %. Furthermore, you may use it if needed, combining the electric charge control agent of negative polarity and the electric charge control agent of straight polarity which were mentioned above two or more.

[0036] Furthermore, a flow improver can be combined with the full color toner of this invention if needed. As a flow improver, for example, a silica, titanium oxide, barium titanate, titanate, titanate-acid magnesium, titanate-acid calcium, strontium titanate, a zinc oxide, silica sand, clay, a mica, clay welded pyroclastic rock, the diatom earth, chromic oxide, cerium oxide, red ocher, an antimony trioxide, magnesium oxide, a zirconium dioxide, a barium sulfate, a barium carbonate, a calcium carbonate, silicon oxide, silicon nitride, etc. can be mentioned, and especially the impalpable powder of a silica is desirable especially. As for the amount of these flow improvers used, it is desirable that it is the range of 0.05 - 0.7 mass % in a toner. It is more than 0.1 mass % more preferably, and is below 0.6 mass %.

[0037] Moreover, additives other than the above if needed can be combined with the full color toner of this invention. For example, by using a release agent, a mold-release characteristic with a heating roller can be made good, and un-offsetting nature can be improved. As a release agent, polyolefine, a fatty-acid metal salt, fatty acid ester, partial saponification fatty acid ester, a higher fatty acid, higher alcohol, paraffin wax, an amide wax, polyhydric-alcohol ester, a silicone varnish, aliphatic series fluorocarbon, a silicone oil, etc. can be mentioned, for example.

[0038] The permeability in 800nm of the full color toner of this invention needs to be 40% or more. This is because it is in the inclination which fault, like the image projected when an image is fixed to an OHP sheet as permeability is less than 40% becomes dark produces. It is 60% or more more preferably.

[0039] The full color toner of this invention can be obtained by pulverizing this, after carrying out melting kneading of above-mentioned polyester resin, carnauba wax, the coloring agent, etc. with a twin screw extruder.

[0040] It is desirable to perform this kneading under the -10-40-degree C conditions of a temperature gradient to the softening temperature of polyester resin. When it kneads on this temperature condition, it is in the inclination which a coloring agent, an electric charge control agent, etc. distribute to homogeneity in a toner. Especially a desirable temperature gradient is -5 degrees C or more, and is 30 degrees C or less.

[0041] Moreover, as for the mean particle diameter of the full color toner of this invention, it is desirable that it is the range of 5-15 micrometers. This is because it is in the inclination used as a highly minute image by setting mean particle diameter to 5 micrometers or more by being in the inclination which can raise the yield of a full color toner, and being referred to as 15 micrometers or less. More preferably, it is 6 micrometers or more and is 13 micrometers or less.

[0042] the fixing system which the full color toner of this invention excels [system] in un-offsetting nature, fixable, and transparency, and does not use oil -- even if it is, it can be used suitably.

[0043]

[Example] Although an example explains this invention further below, this invention is not limited to these. Moreover, the evaluation approach of the resin shown in the example is shown below.

[0044] (1) softening temperature T-four Shimadzu Corp. make -- flow tester CFT-500 -- using -- the bottom of 1mm phix10mm a nozzle, 294 Ns of loads, and the uniform temperature up of the programming rate of 3 degrees C / min -- sample 1.0g -- temperature when 4 innermm flows out was measured.

[0045] (2) It measured using the glass-transition-temperature Tg differential-scanning-calorie meter from the intersection of the base line of a chart and the tangent of an endoergic curve in the programming rate of 5 degrees C / min.

[0046] (3) It measured with the titrimetric method by the acid-number AVKOH solution.

[0047] (4) it can set on a maximum molecular-weight GPC chart -- the start value of the peak by the side of the amount of macromolecules was calculated most.

[0048] (5) The sample obtained by carrying out melting kneading of the transmission (polyester resin) polyester resin 95 mass section and the carnauba wax (Oriental PETORO light company make, carnauba wax No. 1) 5 mass section at 120 degrees C using a twin screw extruder (the IKEGAI factory company make, PCM29) was inserted and pressed in the OHP sheet (conditions: temperature : 180 degrees C, pressure:980kPa, time amount:2min), and the film was obtained. The 800nm permeability of this film was measured using spectrophotometer for ultraviolet and visible region (UV[by Shimadzu Corp.]-2400PC).

[0049] (Full color toner) The reconstruction machine of a commercial copying machine (SF[by Sharp Corp.]- 7850) copied the test chart to the OHP sheet. The 800nm permeability of the toner fixed to the OHP sheet was measured using spectrophotometer for ultraviolet and visible region (UV[by Shimadzu Corp.]-2400PC), and the following criteria estimated the transparency of a toner.

O : 60% or more (transparency is very excellent.)

O : 40 - 60% (transparency is excellent.)

** : 20-40% (transparency is a little inferior.)

x : Less than [20%] (transparency is inferior.)

[0050] (6) The reconstruction machine of a fixable marketing copying machine (SF[by Sharp Corp.]- 7850) copied the test chart, and the regular paper on which the toner rode, without letting the fixing section pass was taken out. It let this test paper pass on the temperature adjustable fixing roller set as roller rate 100 mm/sec and nip width of face of 8.0mm. Cellophane adhesive tape (Nichiban No. 415) was stuck on the toner to which the regular paper was fixed, and the attenuation factor (rate of fixing) of the image concentration after exfoliating subsequently was measured. The temperature of a roller was raised and temperature to which the rate of fixing exceeded 90% was made into the minimum fixing temperature.

O : the minimum fixing temperature is 140 degrees C or less (fixable is excellent.).

** : The minimum fixing temperature is 150 degrees C or less (fixable is a little inferior.).

x : The minimum fixing temperature is 150 degrees C or more (fixable is inferior.).

[0051] (7) When temperature was raised in the un-offsetting nature above-mentioned fixing sex test, the temperature at which a toner began to adhere to a heat roller was measured.

O : adhesion initiation temperature is 200 degrees C or more (un-offsetting nature is very excellent.).

O : adhesion initiation temperature is 180 degrees C or more (un-offsetting nature is excellent.).

** : Adhesion initiation temperature is 160 degrees C or more (un-offsetting nature is a little inferior.).

x : Adhesion initiation temperature is less than (un-offsetting nature is inferior.) 160 degrees C.

[0052] (8) The gloss of the toner fixed to the regular paper was measured using the handicap glossmeter (Nippon Denshoku Industries PG- 1:75 degrees) on the same conditions as the gloss fixing sex test.

O : 40 or more (gloss is very excellent.) GU

O : 30 or more (gloss is excellent.) GU

** : More than 20GU (gloss is a little inferior.)

x : Less than [20GU] (gloss is inferior.)

[0053] According to the preparation presentation shown in the [example 1] table 1, 500 ppm dibutyltin oxide was supplied to the reaction container of a distilling-column equipment to a monomer and all acid components. Subsequently, the esterification reaction was performed for the churning rotational frequency on 265-degree C conditions whenever [24rpm and system-of-reaction internal temperature]. The esterification reaction was terminated when water stopped distilling. Furthermore, keep the temperature in the system of reaction at 230 degrees C, decompress the degree of vacuum in a reaction container so that it may be set to 1.0 or less mmHg over about 40 minutes, the diol component was made to distill from the system of reaction, and the condensation reaction was performed until resin became desired softening temperature. When it became the viscosity with which the viscosity in a system begins to rise gradually and is equivalent to desired softening temperature, after returning the system of reaction to ordinary pressure and suspending heating with a reaction, the reactant was pressurized with nitrogen, and was taken out over about 2 hours, it cooled gradually over 2 hours, and polyester resin A-F was obtained. A resin presentation (analysis value) and a characteristic value are

shown in Table 2.

[0054]

[Table 1]

仕込み組成	実施例					
	A	B	C	D	E	F
テレフタル酸	94	93	93	97	100	100
アジピン酸	6	7	7	3	-	-
ビスフェノール A PO 付加物	40	40	40	30	40	50
ビスフェノール A EO 付加物	-	-	-	-	-	50
エチレングリコール	53	55	60	80	50	-
トリメチロールプロパン	10	10	10	5	15	30

(表中の数字は質量部)

-ビスフェノール A PO 付加物:ポリオキシプロピレン-(2, 0)-2, 2-ビス(4-ヒドロキシフェニル)プロパン

-ビスフェノール A EO 付加物:ポリオキシエチレン-(2, 0)-2, 2-ビス(4-ヒドロキシフェニル)プロパン

[0055]

[Table 2]

樹脂組成(分析値)	実施例					
	A	B	C	D	E	F
テレフタル酸	95	93	94	97	100	100
アジピン酸	5	7	6	3	-	-
ビスフェノール A PO 付加物	40	39	40	29	40	48
ビスフェノール A EO 付加物	-	-	-	-	-	49
エチレングリコール	52	53	59	73	47	-
トリメチロールプロパン	9	9	8	6	14	29
特性値	A	B	C	D	E	F
T _g (°C)	57.2	58.5	58.9	55.2	64.4	58.0
T ₄ (°C)	113	118	120	105	118	107
ΔV(°C)	11.7	8.2	3.3	4.4	11.0	0.5
M _w (peak start 値)	299,000	1,065,000	1,350,000	181,000	1,090,000	193,000
透過率(800nm)	82.5	65.3	60.5	89.5	72.7	83.3

(表中の樹脂組成の数字は質量部)

[0056] Moreover, the obtained polyester resin 89 mass section, the phthalocyanogen copper (great Nissei-ized company make) 5 mass section, the carnauba wax (Oriental PETORO light company make, carnauba wax No. 1) 5 mass section, and the negative triboelectric charging electric charge control agent (ORIENT chemistry company make E-85) 1 weight section were mixed for 30 minutes with the Henschel mixer, and melting kneading of the obtained mixture was carried out with the twin screw extruder (the IKEGAI factory company make, PCM29). Melting kneading set the internal temperature as the softening temperature of resin, and performed it. After kneading, it cooled, the toner soul was acquired, it pulverized with the jet mill pulverizer, the particle size of a toner was prepared with the classifier, and particle size was set to 7 micrometers. Added the silica (the product made from Japanese Aerosil, R-972) of 0.25 mass %, it was made to mix and adhere with a Henschel mixer to the obtained impalpable powder, and toner TA-TF was obtained. The toner property of toner TA-TF is shown in Table 3.

[0057]

[Table 3]

		実施例					
		TA	TB	TC	TD	TE	TF
定着特性	定着性	○	○	△	○	○	○
	非オフセット性	○	◎	◎	△	◎	△
外観	光沢	◎	△	△	◎	○	◎
	透明性	◎	△	△	◎	○	◎
	透過率(800nm)	62.1	38.9	34.8	65.9	55.2	60.3

[0058] Polyester resin G-K was obtained on the same conditions as the [example 1 of comparison] example 1. These preparation presentations, a resin presentation, and a characteristic value are shown in Table 4 and Table 5.

[0059]

[Table 4]

	比較例				
	G	H	I	J	K
テレフタル酸	95	95	100	100	100
アジピン酸	5	5	-	-	-
ビスフェノール A PO 付加物	20	40	30	50	-
ビスフェノール A EO 付加物	-	-	-	50	110
エチレングリコール	90	55	80	-	-
トリメチロールプロパン	10	15	10	40	-

(表中の数字は質量部)

・ビスフェノール A PO 付加物:ポリオキシプロピレン-(2, 0)-2, 2-ビス(4-ヒドロキシフェニル)プロパン
 ・ビスフェノール A EO 付加物:ポリオキシエチレン-(2, 0)-2, 2-ビス(4-ヒドロキシフェニル)プロパン

[0060]

[Table 5]

組成分析	G	H	I	J	K
テレフタル酸	94	95	100	100	100
アジピン酸	6	5	-	-	-
ビスフェノール A PO 付加物	19	38	29	47	-
ビスフェノール A EO 付加物	-	-	-	49	109
エチレングリコール	80	50	71	-	-
トリメチロールプロパン	9	15	9	38	-
特性値	G	H	I	J	K
T _g (°C)	54.7	57.0	54.3	48.0	62.2
T ₄ (°C)	118	130	100	102	107
AV(°C)	3.4	4.9	6.1	0.8	0.3
M _w (peak start 値)	2,194,000	3,628,000	95,000	92,000	89,000
光線透過率(800nm)	42.7	35.3	93.5	79.1	80.3

(表中の樹脂組成の数字は質量部)

[0061] Furthermore, toner TG-TK was obtained on the same conditions as an example 1 using obtained polyester resin G-K. A toner property is shown in Table 6.

[0062]

[Table 6]

		比較例				
		TG	TH	TI	TJ	TK
定着特性	定着性	△	×	○	○	△
	非オフセット性	◎	◎	×	×	×
外観	光沢	×	×	○	△	△
	透明性	×	×	○	△	△
	光線透過率(800nm)	15.2	13.1	58.3	35.6	36.4

[0063] The polyester resin for toners of this invention was excellent in transparency, and further, the full color toner using this was a fixing process, and even if oil was not used for it, it was excellent [toner] in un-offsetting nature or fixable, so that clearly from an example.

[0064] On the other hand, in the example of a comparison with which the conditions of this invention are not filled, transparency, un-offsetting nature, and fixing were incompatible.

[0065]

[Effect of the Invention] As stated above, the polyester resin for toners of this invention and a full color toner can be used suitable for the fixing system in a xerography, an electrostatic printing method, an electrostatic recording method, etc. which does not use oil, and are very useful on industry.

[Translation done.]